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ABSTRACT

This brochure describes PreK-12 technology education in Wisconsin. The first section briefly summarizes Wisconsin's state content standards in the areas of nature of technology, systems, human ingenuity, and impact of technology. The second section covers technology education program scope and sequences for grades PreK-4 (early technology inquiry), grades 5-8 (technology exploration), and grades 9-12 (technology exploration and application). The third section discusses the following components of technology education programs: technology education for all students; career development; curriculum alignment and integration; university and college while in high school; business and industry partnerships; student organizations; and national and state technology organizations. A sidebar describes the TACKLE (Technology Action Coalition to Kindle Lifelong Equity) Box Project, a statewide initiative to increase the number of young women in technology education. The fourth section addresses technological literacy, including the following features of a new framework for technology education: broad, long-term conception of work; strengthened academic foundation; strong secondary-postsecondary connections; and emphasis on long-term careers, beyond entry-level jobs. The fifth section is a list of Web resources for Wisconsin technology education, curriculum and instruction, technology-related programs and information, career and labor market information, student associations, and nation and state technology organizations. (MES)

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reflections on technology education in wisconsin

ED 473 133

"It is imperative that we prepare all students for citizenship and work in an increasingly technological and global society. We need students who are technologically literate because they will be creators of our future, they will be the users of the next generation of technology, and they will be making technology-related decisions more sophisticated than we can possibly imagine."

— *Elizabeth Burmaster, State Superintendent*
Wisconsin Department of Public Instruction

"Our industry demands a rigid adherence to quality, and our product and manufacturing is considered highly technical. Combine this with a forecasted tight labor market, and it is critical that we have a well-educated workforce."

— *Steve Phillips*
Vice President of Quality, Reliability and Service
Harley-Davidson Motor Company
Milwaukee

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wisconsin's state content standards

Nature of Technology

Students in Wisconsin will understand that technology is an extension of human capability.

Systems

Students in Wisconsin will recognize that systems are made up of individual components and that each component affects the operation of the system and its relationship to other systems.

Human Ingenuity

Students in Wisconsin will be able to define problems, gather information, explore options, devise a solution, evaluate the outcome, and communicate the results.

Impact of Technology

Students in Wisconsin will understand that technology affects society and the environment in ways that are both planned and unplanned and desirable and undesirable.

technology education program scope & sequence

GRADES PK-4

Early Technology Inquiry

These years should be devoted to familiarizing students with technology. The inquiry-based environment of elementary education provides a natural basis for integrating technology concepts. Educators begin to foster an awareness of technology in their students' lives through activities offered within units. As a result, students develop an understanding that technology provides solutions for needs, wants, and desires. Exposure to technology at this level is key because it provides foundations for further exploration and application.

GRADES 5-8

Technology Exploration

At this stage, students should be presented with broader technological issues that are found on a societal level. Students inquire, explore, examine, analyze, and evaluate concepts related to technological systems. Through the design or technological process,* students work in teams or independently to generate and construct solutions to real-world problems. Learning opportunities offered through design activities give students an opportunity to formulate decisions pertaining to efficiency, effectiveness, and impacts of solutions.

GRADES 9-12

Technology Exploration & Application

At the high school level, students need to have a variety of options in Technology Education. Some students at this point may have very limited experience or familiarity with technology while others may have extensive knowledge and application skills. A series of exploratory courses that open opportunities to experiment with various areas and develop higher-order skills and problem-solving strategies should be offered. Courses beyond the exploratory level focus on career, technical and employability skills. Students still have an opportunity to explore technology, but skills unique to a technology area or career are the focus.

Students can further education in technology through credit articulation and program alignment and postsecondary youth options, apprenticeships, internships, or school-supervised work-based learning opportunities.

*A systematic problem-solving strategy, with criteria and constraints, used to develop many possible solutions to solve a problem or satisfy human needs and wants and to winnow (narrow) down the possible solutions to one final choice. (International Technology Education Association, *Standards for Technological Literacy: Content for the Study of Technology*)

components of technolog

Technology Education for All Students

Respect for the rights, equality, and dignity of all citizens is a basic American philosophy. A comprehensive technology education program must be accessible to all students, including students preparing for nontraditional training and employment, single parent and pregnant teens, economically disadvantaged students, academically disadvantaged students, individuals with disabilities, students with limited English proficiency, students of color, and individuals with other barriers to educational achievement. Utilizing school and community resources, the technology education curriculum must be flexible to meet the learning needs and styles of all students. Technology education educators must take an active role to ensure that all students have equal access to and equal opportunity for a meaningful education.

Career Development

Students need to explore careers and develop skills necessary to make meaningful decisions. Therefore, every technology education course must infuse each unit with career discussions and information. In addition, some schools may offer youth apprenticeship, certified work-based learning programs, courses on careers, and job shadowing opportunities to further enhance this component of the technology education program.

Curriculum Alignment and Integration

Aligning and integrating the technology education curriculum K-12 within districts is critical to the advancement of technological literacy and knowledge for all students. The scope and sequence of the K-12 curriculum, which is built upon *Wisconsin's Model Academic Standards for Technology Education* and *Standards for Technological Literacy,* should start with a solid foundation established at the elementary and middle school levels and expand into comprehensive course offerings at the high school level. In addition, technology education educators should collaborate with educators from other disciplines to facilitate the transfer of learning and increased student academic achievement.

University and College while in High School

Students who choose technology education courses that are articulated with postsecondary institutions can earn college credit or advanced standing. Other postsecondary opportunities for students include Youth Options, web-based instruction and distance learning. Technology education educators should pursue postsecondary articulation to develop a comprehensive K-16 scope and sequence in technology education. Every student in Wisconsin has the opportunity to earn a University or Technical College transcript before high school graduation.

49% of high school students are female.

Less than 1/5 of high school technology education students are female.

The TACKLE (Technology Action Coalition to Kindle Lifelong Equity) Box Project is a statewide initiative to increase the number of young women in technology education. The Department of Public Instruction, UW-Stout, UW-Madison, and educators around the state work toward this goal by:

- ensuring that all Wisconsin technology education teachers, counselors, and administrators are aware of the need to increase the number of girls in technology education;
- identifying the factors that influence the decisions of girls and young women to participate in technology education;
- developing a set of web-based materials and resources to be used by administrators, educators, counselors, parents, and communities that address the factors influencing girls' participation in technology education;
- providing in-depth training on the factors that influence girls' and young women's participation in technology education and on strategies and actions to increase girls' and young women's participation in technology education; and
- providing support to educators who are implementing strategies and actions in their classrooms to increase the number of girls in technology education.

For more information on the TACKLE Box Project, visit the website at http://www.dpi.state.wi.us/dpi/dlsis/cte/1tbhome.html.

Business and Industry Partnerships

An advisory committee, chaired by a person from labor and/or business and industry and fully representative of the community's gender and racial demographics, should be actively involved in the technology education program. Business and industry partners can, for example, assist in conducting community surveys, needs assessment, and student follow up, develop public relations materials, advise on technology updates, develop mentoring programs, sponsor teacher externships, and participate in mock student interviews.

y education programs

Work-based learning programs *involve trained mentors providing paid work experiences for students to master specific work-site competencies.*

School-based learning programs *involve classroom or independent instruction to master specific industry-based competencies leading to a specific certification.*

Certifications

One of the tenets of technology education is a commitment to applied learning. Either through work-based learning experiences or school-based instruction, students should be offered the opportunity to obtain industry-based certifications.

Student Organizations

A comprehensive technology education program must include a chapter of a technology-related student organization such as Junior Engineering Technical Society (JETS), SkillsUSA — VICA, or Technology Student Association (TSA) and integrate the student organization and technology education curriculum. Student organizations are critical because they build leadership skills, community awareness, personal growth, and recognition for all involved; they provide natural and strong opportunities to collaborate with community businesses and industries. A successful chapter brings pride to the students, the department, the school, and the community.

National and State Technology Organizations

Statewide, educators (administrators, technology education teachers, and counselors) share the responsibility for the future of technology education. To build current programs and to envision and create the programs of tomorrow, it is essential that educators participate in professional organizations related to technology education as a member, as a volunteer, or as a leader – it is the only way to guarantee strong and vibrant programs for our students.

About this reference series

Reflections on Technology Education provides educators (administrators, counselors, teachers), parents, students and business and industry representatives with a blueprint for action: why ALL students should be technologically literate; what a comprehensive program looks like – from the scope and sequence of courses to program components; and where to go for additional information.

Reflections on Technology Education is one in a series of documents produced by the Department of Public Instruction to assist school communities in creating strong technology education programs. For a copy of *Exploring Life's Work – Middle School, Increasing Options Through Life/Work Planning,* and/or *Wisconsin's Model Academic Standards for Technology Education,* please visit www.dpi.state.wi.us/pubsales. For additional information specific to technology education, please visit http://www.dpi.state.wi.us/dpi/dlsis/let/teached.html.

International Technology Education Association (ITEA; online at www.iteawww.org)

is the largest professional educational association, principal voice, and information clearinghouse devoted to enhancing technology education through experiences in our schools (K-12). Its membership of over 40,000 encompasses individuals and institutions throughout the world with the primary membership in North America. ITEA's mission is to advance technological capabilities for all people and to nurture and promote the professionalism of those engaged in these pursuits. Its Wisconsin affiliate, **Wisconsin Technology Education Association** (WTEA; online at www.wtea-wis.org), provides professional development opportunities, publishes quarterly the *Interface*, and members exchange online curriculum.

Association for Career and Technical Education (ACTE; online at www.acteonline.org)

is the largest national education association dedicated to the advancement of education that prepares youth and adults for careers. Its Wisconsin affiliate, **Wisconsin Association for Career and Technical Education** (WACTE; online at www.wacteonline.org), sponsors professional development opportunities, offers a network of local and regional career and technical education professionals, provides regular legislative updates, and links its members with their state and national representatives.

technological literacy

People who are unfamiliar with technology tend to think of it purely in terms of its artifacts: computers, cars, televisions, toasters, pesticides, flu shots, solar cells, genetically engineered tomatoes, and all the rest. But to technology education educators and people who study technology, it is more accurately thought of in terms of the knowledge and the processes that create these products, and these processes are intimately dependent upon many factors in the outside world.

– Standards for Technological Literacy (ITEA, 2000)

A comprehensive technology education program creates the setting in which students learn the knowledge and processes that create technology – in essence, students become technologically literate. Students who are technologically literate are able to engage comfortably and knowledgeably in our increasingly sophisticated and complex world. In addition, these students will become the visionaries – the inventors, business people, and workers – in a world built and dependent on technology.

A student involved in technology education curriculum experiences:

- Designing, developing and utilizing technological systems
- Open-ended, problem-based design activities
- Applying technological knowledge and processes to real world experiences using up-to-date resources
- Working individually as well as in a team to solve problems

Technology education reinforces and complements the material that students learn in other classes. Through technology education classes, students apply and integrate knowledge learned from many other subject areas. For example, students in a technology education class can design and construct models for historical events and places. In English, students may read that a character is experiencing a particular dilemma or problem; they can design a solution to the character's problem in technology education.

Technology education must enhance its traditional focus on providing occupational preparation for entry-level jobs. Technology education must position itself to provide the knowledge, skills, and dispositions students need in a world where change – particularly technological change – is constant and the global economy – again, with an emphasis on technology – is the context for their future. A new framework for technology education would have these features:

Broad, long-term conception of work. Occupationally specific technology education should not be abandoned, but it should be provided in a larger context so that students can generalize learning, make connections between education and work, and adapt to changes in their jobs or careers.

Strengthened academic foundation. Many students need the relevance of learning and applying essential academic skills in a work-related context. In general, this is best done in broadly defined areas – science as applied to the entire technology industry, for example, rather than to a specific occupation.

Strong secondary-postsecondary connections. A lifetime of change will mean a lifetime of learning, often including formal postsecondary education. Broader technology education programs (e.g., construction rather than carpentry) lend themselves better to a range of postsecondary options, including four-year college.

Emphasis on long-term careers, beyond entry-level jobs. For viable long-term careers, students will need academic knowledge and information literacy skills keep pace with change.

(Hoachlander, 1998)

resources

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Wisconsin Resources

Department of Public Instruction: Career and Technical Education Team
http://www.dpi.state.wi.us/dpi/dlsis/let/index.html

Department of Public Instruction: Teacher Education, Professional Development, and Licensing
http://www.dpi.state.wi.us/dpi/dlsis/tel/index.html

Department of Workforce Development: Apprenticeship Program
http://www.dwd.state.wi.us/dweappr/default.htm

University of Wisconsin – Madison: Center on Education and Work
http://www.cew.wisc.edu/

University of Wisconsin – Platteville: Department of Industrial Studies
http://www.uwplatt.edu/~ind_studies/

University of Wisconsin – Stout: College of Technology, Engineering and Management
http://www.uwstout.edu/ctem/progs.html

UW – System: Women and Science Program
http://www.uwosh.edu/wis/girls.htm

Viterbo University: College of Education
http://www.viterbo.edu/academic/ug/education/index.htm

Wisconsin Technical College System
http://www.witechcolleges.com/

Curriculum & Instruction

Association for Supervision and Curriculum Development
http://www.ascd.org

Center to Advance the Teaching of Technology and Science
http://www.iteawww.org/h1.html

Design and Technology Engineering Activities
http://mars2000.enoreo.on.ca/

Elementary Curriculum
http://www.teachingideas.co.uk/

Kathy Schrock's Guide for Educators
http://school.discovery.com/schrockguide/sci-tech/scigs.html

National Skills Standards Board
http://www.nssb.org/

Newton's Apple: Teacher Guides
http://school.discovery.com/schrockguide/sci-tech/scigs.html

Project Lead the Way
http://www.pltw.org/aindex.asp

TACKLE Box Project (Technology Action Coalition to Kindle Lifelong Equity)
http://www.dpi.state.wi.us/dpi/dlsea/equity/tb4tech.html

The Time Plan Virtual Teacher Center
http://www.timeplan.com/vtc/index.htm

Technology-related Programs and Information

American Indian Science and Engineering Society
http://www.aises.org/

Autodesk – *Design Your Future: Math, Science and Technology for Girls*
http://www.autodesk.com/dyf/about/adskcommit.html

BioPharmaceutical Technology Center
http://www.btci.org

Discover Engineering Online
http://www.discoverengineering.org

Educators Website for Information Technology
http://www.edc.org /EWIT/who.htm

Exploring Gender and Technology in Learning Environments: A Web-Based Instructional Resource
http://www.gse.harvard.edu/~wit/exploring/

Girls, Science, and Technology
http://girlstech.douglass.rutgers.edu/

Institute for Women in Trades, Technology and Science
http://www.iwitts.com/html/iwitts.html

National Dissemination Center for Career and Technical Education/The National Research Center for Career and Technical Education
http://nccte.com/

Women and Minorities in Science and Engineering
http://www.mills.edu/ACAD_INFO/MCS/SPERTUS/Gender/wom_and_min.html

Women in Science, Engineering, and Technology
http://www.set4women.gov.uk/

Career and Labor Market Information

2000 Occupational Wage Estimates
http://stats.bls.gov/oes/home.htm

America's Job Bank
http://www.ajb.org/

America's Career InfoNet
http://www.acinet.org/acinet/

Career Guide to Industries, 2002-03 Edition
http://www.bls.gov/oco/cg/home.htm

Coordinator's Manual: Career Mentoring for Middle and Junior High School Girls
http://www.flstw.fsu.edu/menindx.html

Disability Resources
http://www.dol.gov/dol/topic/disability/index.htm

National Employment Matrix (Searchable database)
http://www.bls.gov/asp/oep/nioem/empiohm.asp

Occupational Employment, Training, and Earnings (Searchable database)
http://stats.bls.gov/asp/oep/noeted/empoptd.asp

Occupational Outlook Handbook, 2002-03 Edition
http://www.bls.gov/oco/home.htm

Office of Occupational Statistics and Employment Projects
http://www.bls.gov/emp/

Wisconsin Labor Market Information
http://www.dwd.state.wi.us/lmi/

Student Associations

Junior Engineering Technical Society
http://www.jets.org/

Technology Student Association
http://www.tsawww.org/

Wisconsin SkillsUSA—VICA
http://www.thelocalschools.com/WI/SkillsUSA-VICA/

National and State Technology Organizations

Association for Career and Technical Education
http://www.avaonline.org

International Technology Education Association (ITEA)
http://www.iteawww.org/

National Association of State Directors of Career and Technical Education Consortium
http://www.nasdvtec.org/

Triangle Coalition For Science and Technology Education
http://www.triangle-coalition.org

Wisconsin Technology Education Association
http://www.wtea-wis.org

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